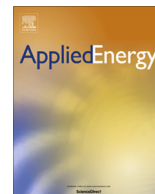




Contents lists available at ScienceDirect

Applied Energy

journal homepage: www.elsevier.com/locate/apenergy

Innovative and sustainable solutions of clean energy technologies and policies (Part II)

ICAE, the International Conference on Applied Energy, was first held in 2009 in Hong Kong. It has grown substantially after the successful conferences in Singapore (2010), Italy (2011), and China (2012). ICAE has firmly established itself as the one of the premier international fora on a wide range of topics related to energy.

Same as previous special issues of ICAE conferences, this special issue, ICAE2013, is a collection of selected papers from the 5th International Conference on Applied Energy, which was held in Pretoria, South Africa, on July 1–4, 2013. ICAE2013 accepted about 500 papers from over 50 countries. The accepted papers were presented in 6 tracks comprising some 80 oral sessions. ICAE2013, powered by the international journal of Applied Energy, seeks to promote innovative research and development efforts in the applied energy areas. The topics covered in ICAE2013 include renewable energy, advanced energy conversion technologies, energy conservation in buildings, advanced energy systems, and environment and climate change from the perspectives of both technology and policy.

Similar to previous ICAE conference special issues [1–6], upon successful conclusion of ICAE2013, about 300 papers were recommended for consideration of further review based on the recommendations of session chairs and the scientific committee of ICAE2013. Following the journal's peer review process, a part of the accepted papers (44) is included in the volume, Part I of ICAE2013 special issue [7]. We publish the 2nd part of papers (42) in this Special Issue of ICAE2013 in Applied Energy.¹

The selected papers in this part cover a broad range of energy sciences and technologies, which can be categorized into generation, processing and utilization of energy from power system point of view. From the generation side, the selected papers presented results in the field of renewables and other conversion technologies. Papers focusing on energy processing described studies on energy storage and other advanced technologies. From the utilization side, research conducted on demand side management and evaluation was presented.

Therefore, there are broadly three main topics covered by the selected papers:

- Renewables and other conversion technologies;
- energy storage and other advanced energy technologies; and
- demand side management and evaluation.

Renewables and other conversion technologies include technology development and applications in the area of electricity generation by means of renewable energy harvesting and conversion from other sources. Renewables including biomass, wind, solar, and nuclear energy were studied. The production, utilization as well as potential of biomass were studied. The pyrolysis kinetics of torrefied tree stump was studied [8]. Possible routes from biomass to sustainable paraffinic fuels to be used by aviation sector were investigated in [9,10]. Potential of biomass energy in Colombia and Malaysia was studied at the country level [11,12]. Optimal component sizing of solar power systems was investigated [13]. Potential benefits and challenges of magnetically geared wind generator were evaluated and discussed [14] and a method to estimate the mean annual energy production of a wind farm with a Geographic Information System was presented [15]. Current state of nuclear power after the Fukushima [16], and the future prospects of nuclear energy in France [17], were studied. Aside from renewables, a variety of electricity generators utilizing advanced conversion technologies were introduced. A type of open-cell metal foam-filled thermoelectric generator was presented [18], the development of a 3 kW double-acting thermoacoustic Stirling electric generator was reported [19], a concept for electricity generation based on the upward momentum created by balanced forced air movement in a divergent chimney was introduced [20], and options for district heat production systems (DHSS) were analyzed under different social and environmental scenarios [21]. For the purpose of monitoring and safe operation of Solid Oxide Fuel Cells (SOFCs), a simulation model was developed as diagnostics tool for early fault detection, diagnosis and correction [22].

Energy storage and other advanced energy technologies include energy processing technologies. This topic mainly consists of two parts. The first part is energy storage technologies, where sustainability index approach applied as a selection criteria for energy storage systems [23], experimental evaluation of lithium batteries for automobile applications [24], economic viability of hydrogen storage for wind power plants [25], were studied. The second part comprises new technologies related to the processing and production of energy. A device based on phase change materials to smooth off-gas temperatures for steel industry in order to facilitate energy recovery was studied [26]. Several studies on advanced air conditioning systems were carried out. For example, a bed-based task/ambient air conditioning system was experimentally and numerically analyzed [27], thermal hydraulic performance of a liquid–vapor separation condenser was evaluated [28], and a dew-point evaporative air conditioner was studied [29]. Heat transfer performance of a receiver for a parabolic trough solar

¹ We are also editing another special issue of ICAE2013 to be published in another journal, International Journal of Green Energy.

collector with perforated plate inserts was numerically studied [30]. In the more fundamental studies, the use of HFC-161 as a substitution of HFC-134a in small automobile air-conditioning systems [31], electro-osmosis regeneration of macro-porous silica gel (MSG) desiccant [32], flow mechanism inside a liquid desiccant dehumidifier [33], and characterizing the combustion of different blended steelworks gas compositions by adopting an outwardly propagating spherical flame configuration [34], were studied.

Demand side management and evaluation cover research that addresses energy related problems from the demand side point of view and studies that assess the impacts of demand side management technologies and projects. In terms of high level methodology and policy development in this area, a framework for designing Sankey diagrams for identifying potential areas for energy savings and other objectives at national level was presented [35], and inter-provincial carbon emission trading model of China was discussed [36]. Oil price shocks' impact on China's macroeconomic was analyzed [37] as well as the dynamics of co-movement between crude oil futures and spot prices [38]. In terms of specific technology development to address demand side energy management problems, a socio-technical commercial building energy management tool empowering occupant to conserve energy was presented [39]. In addition, optimization and operation control methodologies with application to various industrial processes were presented. Optimization approaches were proposed for off-gas management for integrated steelwork [40], integrated heat, mass and pressure exchange network of chemical plants [41], design and synthesis of utility systems [42], and operation of photovoltaic water pumping systems [43]. A control method based on ANN predictive control is studied for hybrid ground source heat pump systems [44]. Climate change mitigation potential by utilizing renewable energy was studied for grassland irrigation [45] and desalination [46]. The effect of adding 1,4-Dioxane with kapok biodiesel to improve the performance and emission characteristics of a diesel engine was analyzed [47]. In addition, emission reduction potential and efficiency improvement of China's iron and steel industry were reported [48].

It is of great interest to note that an emerging research area, measurement and verification, which is the process of using measurement to reliably determine actual savings created within an individual facility by an energy management program, has been studied and discussed. This area is being developed and driven by the international clean development mechanism that requires emissions reduction projects to be measured and verified by a third party to avoid conflict of interest and ensure integrity. Literature in this area is scarce, following the paper that established a mathematical model for the measurement and verification problem [49] and the research that addressed the metering cost minimization problem for lighting measurement and verification projects [50], paper [51] of this special issue further investigated the metering cost problem with consideration of lighting population decay dynamics.

We would like to take this opportunity to thank all authors and participants for their contributions to ICAE2013 and to this special issue. We would also like to acknowledge the contributions of our reviewers who have helped us with their insightful reviews so as to ensure quality of the accepted papers. Finally, we would like to thank our scientific committee members and other colleagues who have provided significant support to ICAE2013, chaired the sessions, and reviewed the papers.

References

- [1] Leung DYC, Yang HX, Yan J. Editorial for special issue of the first international conference on applied energy, ICAE'09, Hong Kong, January 5–7, 2009. *Appl Energy* 87(9):2861.
- [2] Yang H, Leung DYC, Yan J. Special issue of first international conference on Applied Energy – ICAE2009. *Int J Green Energy* 2010;7(3).
- [3] Leung DYC, Yang HX, Yan J. Novel studies on hydrogen, fuel cell and battery energy systems, special issue of ICAE2009. *Int J Energy Res* 2011;35(1).
- [4] Birgersson KE, Balaya P, Chou SK, Yan J. Energy solutions for a sustainable world. *Appl Energy* 2013;90(1):1–2.
- [5] Desideri U, Yan J. Clean energy technologies and systems for a sustainable world. *Appl Energy* 2013;97:1–4.
- [6] Yan J, Chou SK, Desideri U, Tu ST, Jin HG. Research, development and innovations for sustainable future energy systems. *Appl Energy* December 2013;112:393–5.
- [7] Yan J, Chou SK, Desideri U, Xia X. Innovative and sustainable solutions of clean energy technologies and policies (Part I). *Appl Energy* October 2014;130(1):447–9.
- [8] Tran K-Q, Bach Q-V, Trinh TT, Seisenbaeva G. Non-isothermal pyrolysis of torrefied stump – a comparative kinetic evaluation. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.08.02>.
- [9] Chiaramonti D, Prussi M, Buffi M, Tacconi D. Sustainable bio kerosene: process routes and industrial demonstration activities in aviation biofuels. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.08.06>.
- [10] Wang T, Li K, Liu Q, Zhang Q, Qiu S, Long J, et al. Aviation fuel synthesis by catalytic conversion of biomass hydrolysate in aqueous phase. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.06.03>.
- [11] Gonzalez-Salazar MA, Morini M, Pinelli M, Spina PR, Venturini M, Finkenrath M, et al. Methodology for estimating biomass energy potential and its application to Colombia. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.07.00>.
- [12] Tan ST, Hashim H, Lim JS, Ho WS, Lee CT, Yan J. Energy and emissions benefits of renewable energy derived from municipal solid waste: analysis of a low carbon scenario in Malaysia. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.06.00>.
- [13] Bianchi M, Branchini L, Ferrari C, Melino F. Optimal sizing of grid-independent hybrid photovoltaic-battery power systems for household sector. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.07.05>.
- [14] Wang R-J, Gerber S. Magnetically geared wind generator technologies: opportunities and challenges. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.07.07>.
- [15] Grassi S, Junghans S, Raubal M. Assessment of the wake effect on the energy production of onshore wind farms using GIS. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.05.06>.
- [16] Nian V, Chou SK. The state of nuclear power two years after Fukushima – The ASEAN perspective. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.04.030>.
- [17] Maizi N, Assoumou E. Future prospects for nuclear power in France. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.03.056>.
- [18] Wang T, Luan W, Wang W, Tu S-T. Waste heat recovery through plate heat exchanger based thermoelectric generator system. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.07.083>.
- [19] Wu Z, Yu G, Zhang L, Dai W, Luo E. Development of a 3 kW double-acting thermoacoustic Stirling electric generator. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.04.105>.
- [20] Chan C-Y, Hu S-Y, Raynal M, Leung DYC, Chang APS, Yao J-B. A telescopic divergent chimney for power generation based on forced air movement: principle and theoretical formulation. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.04.086>.
- [21] Truong N, Gustavsson L. Minimum-cost district heat production systems of different sizes under different environmental and social cost scenarios. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.07.080>.
- [22] Sorce A, Greco A, Magistri L, Costamagna P. FDI oriented modeling of an experimental SOFC system, model validation and simulation of faulty states. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.03.074>.
- [23] Raza SS, Janajreh I, Ghenai C. Sustainability index approach as a selection criteria for energy storage system of an intermittent renewable energy source. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.04.080>.
- [24] Capasso C, Veneri O. Experimental analysis on the performance of lithium based batteries for road full electric and hybrid vehicles. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.04.013>.
- [25] Kroniger D, Madlener R. Hydrogen storage for wind parks: a real options evaluation for an optimal investment in more flexibility. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.04.041>.
- [26] Nardin G, Meneghetti A, Dal Magro F, Benedetti N. PCM-based energy recovery from electric arc furnaces. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.07.052>.
- [27] Ning M, Dongmei P, Mingyin C, Shiming D. Experimental and numerical studies on the performance evaluation of a bed-based task/ambient air conditioning (TAC) system. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.06.022>.
- [28] Zhong T, Chen Y, Hua N, Zheng W, Luo X, Mo S. In-tube performance evaluation of an air-cooled condenser with liquid–vapor separator. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.07.032>.
- [29] Cui X, Chua KJ, Yang WM. Numerical simulation of a novel energy-efficient dew-point evaporative air cooler. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.04.040>.
- [30] Mwisigye A, Bello-Ochende T, Meyer JP. Heat transfer and thermodynamic performance of a parabolic trough receiver with centrally placed perforated plate inserts. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.03.037>.

- [31] Wu M, Yuan XR, Xu YJ, Qiao XG, Han XH, Chen GM. Cycle performance study of ethyl fluoride in the refrigeration system of HFC-134a. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.05.068>.
- [32] Zhang G, Tian C, Shao S. Experimental investigation on adsorption and electro-osmosis regeneration of macroporous silica gel desiccant. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.04.087>.
- [33] Luo Y, Yang H, Lu L. Dynamic and microscopic simulation of the counter-current flow in a liquid desiccant dehumidifier. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.06.023>.
- [34] Pugh D, Crayford AP, Bowen PJ, O'Doherty T, Marsh R, Steer J. Laminar flame speed and markstein length characterisation of steelworks gas blends. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.04.044>.
- [35] Soundararajan K, Ho HK, Su B. Sankey diagram framework for energy and exergy flows. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.08.070>.
- [36] Cui L-B, Fan Y, Zhu L, Bi Q-H. How will the emissions trading scheme save cost for achieving China's 2020 carbon intensity reduction target? *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.05.021>.
- [37] Ju K, Zhou D, Zhou P, Wu J. Macroeconomic effects of oil price shocks in China: an empirical study based on Hilbert-Huang transform and event study. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.08.037>.
- [38] An H, Gao X, Fang W, Ding Y, Zhong W. Research on patterns in the fluctuation of the co-movement between crude oil futures and spot prices: a complex network approach. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.07.081>.
- [39] Gulbinas R, Jain RK, Taylor JE. BizWatts: a modular socio-technical energy management system for empowering commercial building occupants to conserve energy. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.07.034>.
- [40] Porzio GF, Nastasi G, Colla V, Vannucci M, Branca TA. Comparison of multi-objective optimization techniques applied to off-gas management within an integrated steelwork. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.06.086>.
- [41] Dong R, Yu Y, Zhang Z. Simultaneous optimization of integrated heat, mass and pressure exchange network using exergoeconomic method. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.07.047>.
- [42] Luo X, Hu J, Zhao J, Zhang B, Chen Y, Mo S. Multi-objective optimization for the design and synthesis of utility systems with emission abatement technology concerns. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.06.07>.
- [43] Zhang J, Liu J, Campana PE, Zhang R, Yan J, Gao X. Model of evapotranspiration and groundwater level based on photovoltaic water pumping system. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.05.04>.
- [44] Gang W, Wang J, Wang S. Performance analysis of hybrid ground source heat pump systems based on ANN predictive control. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.04.005>.
- [45] Olsson A, Campana PE, Lind M, Yan J. Potential for carbon sequestration and mitigation of climate change by irrigation of grasslands. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.08.025>.
- [46] Ghaffour N, Lattemann S, Missimer T, Ng KC, Sinha S, Amy G. Renewable energy-driven innovative energy-efficient desalination technologies. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.03.033>.
- [47] Vedharaj S, Vallinayagam R, Yang WM, Chou SK, Lee PS. Effect of adding 1,4-Dioxane with kapok biodiesel on the characteristics of a diesel engine. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.04.012>.
- [48] Chen W, Yin X, Ma D. A bottom-up analysis of China's iron and steel industrial energy consumption and CO₂ emissions. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.06.002>.
- [49] Xia X, Zhang J. Mathematical description for the measurement and verification of energy efficiency improvement. *Appl Energy* 2013;111:247–56. <http://dx.doi.org/10.1016/j.apenergy.2013.04.063>.
- [50] Ye X, Xia X, Zhang J. Optimal sampling plan for clean development mechanism energy efficiency lighting projects. *Appl Energy* 2013;112:1006–15. <http://dx.doi.org/10.1016/j.apenergy.2013.05.064>.
- [51] Ye X, Xia X, Zhang J. Optimal sampling plan for clean development mechanism lighting projects with lamp population decay. *Appl Energy* 2014. <http://dx.doi.org/10.1016/j.apenergy.2014.07.056>.

J. Yan

School of Chemical Science and Engineering,
Royal Institute of Technology,
100 44 Stockholm, Sweden

School of Sustainable Development of Society and Technology,
Mälardalen University, 72123 Västerås, Sweden
E-mail address: jinyue@kth.se

S.K. Chou

Department of Mechanical Engineering,
National University of Singapore,
9 Engineering Drive 1, Blk EA, #04-12,
Singapore 117576, Singapore

Energy Studies Institute, National University of Singapore,
29 Heng Mui Keng Terrace, Blk A, #10-01,
Singapore 119620, Singapore
E-mail address: skchou@nus.edu.sg

U. Desideri

Dipartimento di Ingegneria, Università di Perugia,
Via G. Duranti 93,
06125 Perugia, Italy
E-mail address: umberto.desideri@unipg.it

X. Xia

Centre of New Energy Systems,
Department of Electrical,
Electronic and Computer Engineering,
University of Pretoria, South Africa
E-mail address: xxia@up.ac.za

Available online xxxx